

Strem Chemicals, Inc.

Newburyport, MA, USA

Brief Corporate Overview

MOVE Conference
November 18-19, 2013

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Senior Technical Specialist

Company History & Background

- 1964 company founded in MA
- 1986 established European HQ
- 65 employees: 11 PhD's
- Member SOCMA
 - Society of chemical manufacturers and affiliates
 - 2013, 2012 Gold Award
- World-wide customer base
- Catalog of 4,000 Specialty Chemicals for Research & Production
 - Inorganics, Organometallics, Catalysts, Ligands, Nanomaterials, CVD/ALD Precursors
 - MOFs and reagents for MOF synthesis
- Custom Synthesis and cGMP Manufacturing



Manufacturing Facilities & Equipment

Corporate HQ
Newburyport, MA, USA
(48,000 sq feet)



Laboratory Chemicals



- Lab scale to 22 L glass reactors
- Larger scale with partners

cGMP (kilo-lab)



High Pressure



1L, 2L & 5, 25
gallon autoclaves

Core Technical Competencies

Synthesis of Specialty Chemicals

- High pressure synthesis (autoclaves)
 - metal carbonyls
- Inorganics / Organometallics
 - MOF metal building blocks
- Ligands (MOF linkers)
 - eg P-, N-, O-, C- donor ligands
- Chiral catalysts & ligands
- Nanomaterials
- Scale up of academic processes
 - Maximize yield, reduce waste, make more economically



Company Strategy

- Quality #1- most items 98% or better (to 5N's)
 - From an Inorganic/Organometallic perspective vs Organic
- Service - customer & technical
 - availability, delivery, response
- Price - competitive
- Focus on core technical strength & product area
 - NOT one-stop shopping for everything
 - Strem Catalog 4,000 “specialty inorganic” products, other catalogs 40,000-60,000 “organics”
- Technology diffusion. Commercialize new technology for R&D and Production.

Company Strategy: Provide specialty chemicals of high **quality**, in a **timely** fashion..



- QUALITY
- All production lots analyzed, Certificate of Analysis for each lot
- Result of “poor quality chemicals”:
 - In production
failed batch= run again, lost\$
 - In research = killed a good idea
- SERVICE
- Large inventory
= rapid customer service
- Most orders shipped from stock
- Most items shipped day ordered

How Strem Builds In High Quality: Warehouse-Packaging



- Suitable packaging environment eg glove box, glove bag,
- Suitable packaging container eg vial, bottle, ampoule
- Appropriate storage conditions eg cold, RT, no light

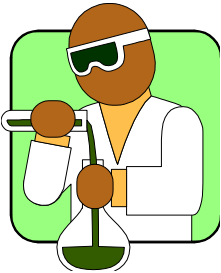


Company Strategy

Strem's Role: Technology Diffusion

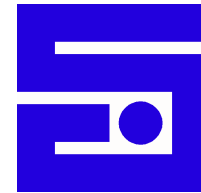
A Channel to Market-- Availability = Use = Opportunity

1. Innovation/Patent



2. Technology transfer

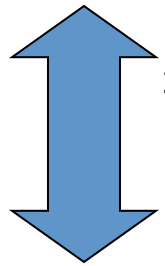
Strem license



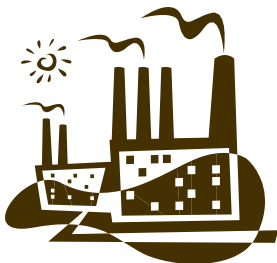
3. Manufacturing

Scale-Up

Promotion / Distribution

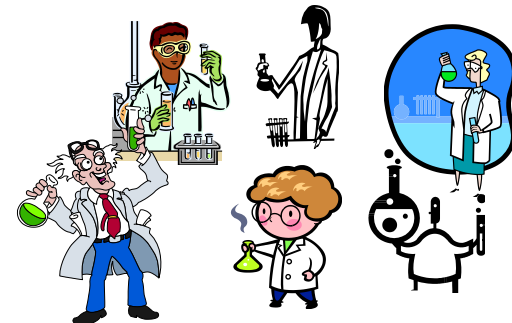


5a. License for
Use \$\$\$\$\$



5b. Commercial
Use

4. Customer R&D



Strem Availability = Fast Delivery =
Use = Technology Diffusion



- Extensive inventory = rapid customer service
- Most orders shipped from stock
- Most items shipped day ordered

Industrial / Academic Collaborations

Licensing Agreements:

- Global industrial relationships
 - Selected examples: N.America (Dupont), Europe (BASF, DSM, Evonik, Asia (Nagase, Takasago, Zannan)
- Variety of application areas
 - Catalysis (homo/heterogeneous) , Polymer (RAFT agents), Microelectronics (CVD/ALD precursors), Nanomaterials, MOFs.
- Academic relationships
 - Eg MIT, Harvard, Max Planck, Weizmann Institute

MOF Product Examples

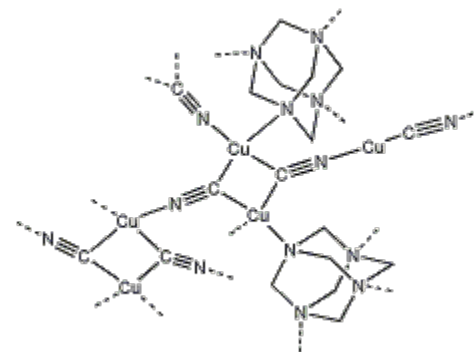
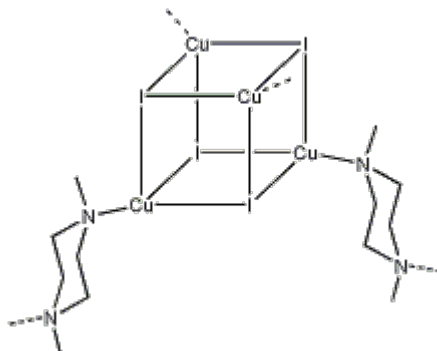
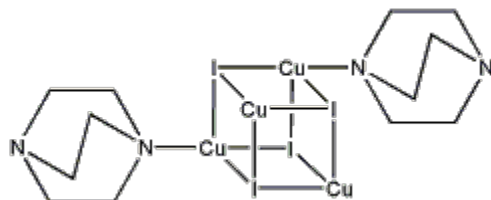
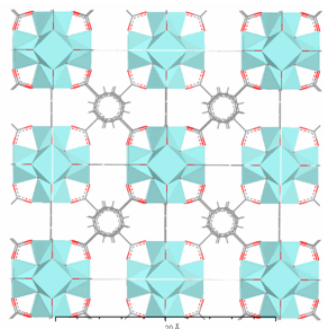
30-4015 Zinc 2-methylimidazole MOF (ZIF-8)

40-1105 Zirconium 1,4-dicarboxybenzene MOF (UiO-66)

29-3015 Bis(1,4-diazabicyclo[2.2.2]octane)tetra(copper(I) iodide) (CuI)₄(DABCO)₂

29-0550 Bis(N,N'-dimethylpiperazine)tetra[copper(I) iodide], 98% MOF

29-0565 (Hexamethylenetetramine)penta[copper(I) cyanide], 98% MOF



Ligands & Metal Precursors / Inorganics for MOF Synthesis

08-0175 [1,1'-Biphenyl]-4,4'-dicarboxylic acid, min. 98%

08-1165 1,4-Phenylenediacetic acid, 97%

07-0435 1,4-Di(4'-pyrazolyl)benzene, min. 97%

07-3110 Tris(isobutylaminoethyl)amine, min 97%

15-0268 Bis(4-carboxyphenyl)(4-trifluoromethylphenyl)phosphine, min. 97% p-Miran2phos

